Instrument Incubator

Snow and Water: Imaging Spectroscopy for coasts and snow cover (SWIS)

Completed Technology Project (2014 - 2017)

Project Introduction

This proposal addresses the NASA Earth Science focus areas of Carbon Cycle & Ecosystems, and Water & Energy Cycle. We will develop and demonstrate a scalable imaging spectrometer system that is suitable for small satellites, including CubeSats. Deploying a small number of such satellites is a cost-effective way to close the gap in high spatial and temporal resolution measurements over targeted areas of the Earth's surface. The technology enhances the ability of future NASA missions to address critical science in two localized regions of the Earth: the coastal zone and snow/ice covered mountains. In both cases, high-fidelity imaging spectrometer measurements are needed with comparatively frequent revisit. The high dynamic range needed to sample both bright (snow) and dark (ocean) targets requires a unique and innovative design, as proposed here. Compelling scientific questions can be addressed in both cases with the different orbits of 30–60 m resolution with weekly sampling, and 120–180 m resolution with near daily global revisit times. To address these questions we will demonstrate a high-uniformity, low-polarization sensitivity imaging spectrometer operating in the 350–1700 nm spectral region. We will also demonstrate an on-board calibration system to address the stringent radiometric stability and knowledge that these missions require. The dynamic range of the spectrometer is achieved through high throughput, rapid readout rate, and programmable integration time. A new HgCdTe detector array, optimized for high temperature operation will be fabricated. The array will also feature a linear variable anti-reflection coating to enhance quantum efficiency and minimize backscatter. A CubeSat-compatible assembly comprising the optomechanical system, detector array, and on-board calibrator will be tested in thermal vacuum and vibrated to typical launch loads. The period of performance is three years with an assumed start of April 2014. The entry and exit TRL are 4 and 6 respectively.

Develop and demonstrate a scalable imaging spectrometer system that is suitable for small satellites, including cubesats, and with performance characteristics that can address the demanding observational requirements for monitoring coastal ecosystems as well as snow covered areas, including: - high-fidelity imaging spectrometer measurements - high temporal sampling - high spatial resolution - high dynamic range to cover both bright (snow) and dark (ocean) targets

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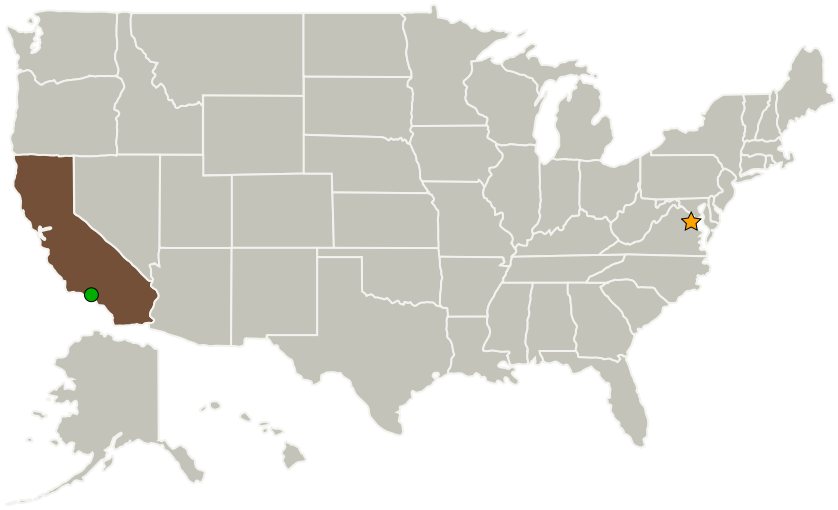
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
●Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Instrument Incubator

Project Management

Program Director:

Pamela S Millar

Program Manager:

Parminder S Ghuman

Principal Investigator:

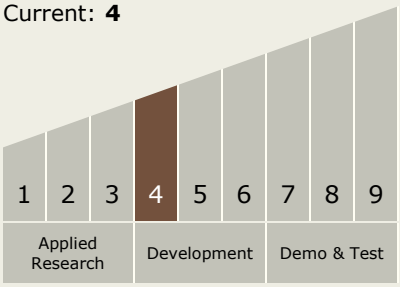
Pantazis Mouroulis

Co-Investigator:

Karen R Piggee

Technology Maturity (TRL)

Start: **4**
Current: **4**



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Images

91-1373479894122.png
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(https://techport.nasa.gov/image/5134)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destination

Earth